

REMARKS

Claims 1-5 and 7-15 are pending in the application.

Claims Rejections 35 U.S.C. 102

Claims 1-4 and 7-15 are rejected by the Examiner under 35 U.S.C. 102(b) as being anticipated by Ueda et al. (US 6,340,016). The Examiner's rejection has been carefully considered.

Ueda discloses a starting device for a direct injection internal combustion engine that allows starting of the engine to occur swiftly. This is done, in part, by executing fuel injection and ignition immediately with a cylinder in the compression stroke of a stopped engine (see, for example, column 12, lines 33-48; Figure 9; and column 14, lines 32-36). According to Ueda, the cylinder of the engine that is in the compression stroke is identified and fuel is injected into the cylinder during the compression stroke. In order to avoid knocking, the ignition timing is set to an optimum level just preceding the onset of knocking.

Unlike Ueda, the presently claimed invention, as recited in claims 1 and 2, control parameters are calculated to identify a cylinder that is in a compression phase or an intake phase and fuel injection does not occur until, in starting, the cylinder entering a compression phase or an intake phase has passed its top dead center. In particular, fuel is not injected into the cylinder during the compression stroke. Ueda does not disclose the prevention of self ignition by delaying fuel injection into the cylinder until after the cylinder has passed its top dead center.

Present claim 1 recites a device for controlling a direct injection internal combustion engine comprising a calculation means that, before a start of the engine, recognizes a possible self-ignition operating state as a function of operating parameters and ascertains suitable control parameters for preventing this possible self-ignition

operating state; and means for varying an injection of fuel into a cylinder such that fuel injection does not occur until, in starting, the cylinder entering a compression phase or an intake phase has passed its top dead center.

Present claim 2 recites a method for controlling a direct injection internal combustion engine, comprising the steps of: [1] recognizing, before a start of the engine, as a function of operating parameters, a possible self- ignition operating state; [2] ascertaining control parameters suitable for preventing this possible self- ignition operating state; and [3] varying an injection of fuel into a cylinder such that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center.

Claims 1 and 2 of the present invention recite conditions in which knocking cannot occur during the compression phase of the cylinder because only air, not an air-fuel mixture is present in the cylinder. Ueda discloses taking the octane of the fuel into account and adjusting the amount of fuel according to the fuel octane rating and other parameters, but Ueda does not disclose the prevention of self ignition by varying an injection of fuel into a cylinder such that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center.

In the rejections of claims 1 and 2, the Examiner cites the abstract, column 7, lines 10-55, and S26 in Figure 3 in Ueda as disclosing “*a means for varying an injection (via controller 21) of fuel into a cylinder such that fuel injection does not occur until, on starting, the cylinder entering a compression phase (see Figure 9).*” This is not the language recited in the present claims and does not address the limitation that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center. Ueda discloses injecting fuel during the compression stroke in a lean mixture, but this mixture does contain fuel and it is not disclosed as being delayed until after the cylinder has passed its top dead center.

In the response to Applicant's arguments, the Examiner cites column 9, lines 55-65 as clearly disclosing the claimed subject matter. There is not mention in this passage of preventing the injection of fuel into a cylinder until it has passed its top dead center. Instead, this passage supports Applicant's argument that Udea discloses the prevention of knocking based on altering the amounts of fuel and air in the fuel-air mixture injected but not the timing of the injection of fuel such that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center.

In view of the foregoing arguments, Applicant respectfully requests that the rejection of claims 1-4 and 7-15 under 35 U.S.C. 102(b) be withdrawn. If the rejection is maintained, Applicant respectfully requests that the Examiner cite where Udea explicitly discloses controlling the timing of the injection of fuel such that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center.

Claims Rejections 35 U.S.C. 103

Claims 5 and 12 are rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over Ueda et al. (US 6,340,016) in view of Akimoto (US 5,676,108). The Examiner's rejection has been carefully considered.

The rejection is based on the assertion that Ueda discloses all the limitations of claim 4. As argued against the rejection of claims under 35 U.S.C. 102, Ueda does not disclose the limitation in claims 1 and 2 that fuel injection does not occur until, on starting, the cylinder entering a compression phase or an intake phase and has passed its top dead center. Consequently, Ueda et al. does not teach or suggest an apparatus or method as recited in claims 1 and 2, or their dependent claims. Akimoto also fails to teach or suggest an apparatus or method that prevents self-ignition at engine start by varying the injection of fuel into a cylinder such that fuel injection does not occur until

the cylinder entering a compression phase or an intake phase has passed its top dead center. Accordingly, Applicant respectfully requests that the rejection of claims 5 and 12 under 35 U.S.C. 103(a) be withdrawn.

Conclusion

The application in its amended state is believed to be in condition for allowance. Action to this end is courteously solicited. Should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone call in order to discuss appropriate claim language that will place the application into condition for allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Michael J. Striker', with a long horizontal flourish extending to the right.

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